

ITEM 402



HIGH DENSITY CORRUGATED POLYETHYLENE PIPE

This Item shall govern for the furnishing and installing of all 18 inch to 48 inch High Density Corrugated Polyethylene pipe for constructing storm sewer mains, laterals, and stubs. The pipes shall be of the sizes, types, design and dimensions shown on the plans and shall include all connections and joints to new or existing pipes, manholes, inlets, headwalls and other appurtenances as may be required to complete the work.

MATERIALS:

Unless otherwise specified on the plans or herein, High Density Corrugated Polyethylene (HDPE) pipe and joint fittings shall conform to the following:

HDPE pipe and fittings shall meet the requirements as in AASHTO M 294.

1. Raw Materials: The pipes and the fittings shall be manufactured from virgin Polyethylene (PE) compounds, which conform to the requirements of cell class 335400C as defined and described in ASTM D 3350, except that carbon black content shall not exceed 5%. PE compounds shall meet the Environmental Stress Crack Resistance according to the SP-NCTL test set forth in AASHTO M 294.

2. Designation of Type. The HDPE pipes used for gravity flow drainage applications shall be of Type S (outer corrugated wall with smooth inner liner) or Type D (inner and outer smooth walls braced circumferentially or spirally with projections or ribs).

3. Section Properties. Minimum wall thickness of the inner walls of Type S pipe and inner and outer walls of Type D pipe shall be as specified in Section 7.2.2 of AASHTO M 294. The pipe stiffness at 5% deflection, when determined in accordance with ASTM designation D 2412, shall be as specified in Section 7.4 of AASHTO M 294.

4. The manufacturer shall perform appropriate test procedures on representative samples of pipe furnished, and verify that the pipe complies with the specifications. A certificate of compliance will be submitted to the Engineer for review and

approval. The certificate will include the following information: manufacturing plant, date of manufacture, pipe unit mass, material distribution, pipe dimensions, pipe stiffness, pipe flattening, brittleness, ASTM resin cell classification.

5. Inspection: The quality of materials, the process of manufacture, and the finished pipe will be subject to inspection and approval by the Engineer at the manufacturing plant. In addition, the finished pipe will be subject to further random inspection by the Engineer at the project site prior to and during installation.

MARKING:

All pipe shall be clearly marked at intervals of not more than 12 ft, and fittings and couplings shall be clearly marked as follows:

1. Manufacturer's name or trademark.
2. Nominal size.
3. Specification designation (e.g. AASHTO M 294).
4. Plant designation code.
5. Date of manufacture

JOINTS:

Joints shall be installed such that the connection of pipe sections will form a continuous line free from irregularities in the flow line.

Joints shall conform to one of the following:

1. Integral Bell and Spigot. The bell shall overlap a minimum of two corrugations of the spigot end when fully engaged. The spigot end shall have an O-ring gasket that meets ASTM F

477: Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

2. Exterior Bell and Spigot. The bell shall be fully welded to the exterior of the pipe and overlap the spigot end so that the flow lines and ends match when fully engaged. The spigot end shall have an O-ring gasket that meets ASTM F 477: Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

3. Watertight Joints – Joints meeting the requirements of ASTM 3212.

CONSTRUCTION METHODS:

Only trench installation of HDPE pipe will be permitted.

1. Excavation. All excavation shall be in accordance with the requirements of Item 400, "Excavation, Trenching and Backfilling".

The width of the trench for pipe installation shall be sufficient, but no greater than necessary, to ensure working room to properly and safely place and compact haunching and other embedment materials. The space between the pipe and trench wall must be wider than the compaction equipment used in the pipe zone.

When Type I backfill is used, the minimum trench width is the pipe outside diameter plus 12 inches.

When Type II or Type III backfill is used, the minimum trench width shall be as specified in Table I.

Table I
Minimum Trench Width

Nominal Pipe Diameter (Inches)	Minimum Trench Width (Inches)
18	44
24	54
30	66
36	78
42	84
48	90

2. Installation in Embankment. If any portion of the pipe projects above the existing ground level, an embankment shall be constructed as shown in the plans or as directed by the Engineer for a distance outside each side of the pipe location of not less than five times the diameter and to a minimum elevation of 2 feet above the top of the pipe. The trench shall then be excavated to a width as specified in section 6.1 above.

3. Shaping and Bedding. The pipe shall be bedded in a foundation of compacted cohesionless material, such as sand, crushed stone, or pea gravel, with a maximum size not exceeding 3/8". This material shall extend a minimum of 6 inches below the outermost corrugations or ribs, and shall be carefully and accurately shaped to fit the lowest part of the pipe exterior for a least 10 percent of the overall height. When requested by the Engineer, the Contractor shall furnish a template for each size and shape of pipe to be placed for use in checking the shaping of the bedding. The template shall consist of a thin plate or board cut to match the lower half of the cross section of the pipe.

4. Handling and Storage. Store pipe above ground on adequate blocking. Keep pipe clean and fully drained at all times during storage. Handling and storage of HDPE pipe shall be in accordance with the pipe manufacturer's instructions. Proper facilities shall be provided for hoisting and lowering pipe into the trench without damaging the pipe or disturbing the bedding or the walls of the trench.

5. Laying Pipe. Unless otherwise authorized by the Engineer, the laying of pipes on the bedding shall be started at the outlet end with the separate sections firmly joined together. Proper facilities shall be provided for hoisting and lowering the section of pipe into the trench without damaging the pipe or disturbing the bedding and the sides of the trench. Any pipe which is not in alignment or which shows any undue settlement after laying shall be removed and relaid at the Contractor's expense.

Multiple installation of HDPE pipe shall be laid with the center lines of individual barrels parallel. Unless otherwise indicated on the plans, the

following clear distances between outer surfaces of adjacent pipes shall be maintained:

Nominal Pipe Diameter	Clear Distance Between Pipes
18"	1'-2"
24"	1'-5"
30"	1'-8"
36"	1'-11"
42"	2'-2"
48"	2'-5"

REUSE OF EXISTING APPURTENANCE:

When existing appurtenances are specified on the plans for reuse, the portion to be reused shall be severed from the existing culvert and moved to the new position previously prepared, by approved methods.

Connections shall conform to the requirements for joining sections of pipes as indicated herein or as shown on the plans. Any headwalls and any aprons or pipe attached to the headwall that are damaged during moving operations shall be restored to their original condition at the Contractor's expense. The Contractor, if he so desires, may remove and dispose of the existing headwalls and aprons and construct new headwalls at his own expense, in accordance with the pertinent specifications and design indicated on the plans or as furnished by the Engineer.

CONNECTIONS AND STUB ENDS:

Connections of pipe to existing or appurtenance shall be as shown on the plans or as directed by the Engineer. The bottom of the existing structure shall be mortared or concreted if necessary, to eliminate any drainage pockets created by the new connection. Where the pipe is connected into existing structures, which are to remain in service, any damage to the existing structure resulting from making the connection shall be restored by the Contractor to the satisfaction of the Engineer. Stub ends, for connections to future work not

shown on the plans, shall be sealed by installing watertight plugs into the free end of the pipe.

BACKFILLING:

Backfill from the pipe bedding up to 1 foot above the top of the pipe is critical for the successful performance of the pipe. Pipe backfill provides necessary structural support to the pipe and controls pipe deflection. Special emphasis is to be placed upon the need for obtaining uniform backfill material and uniform compacted density throughout the length of the pipe, so that unequal pressure will be avoided. Care should be taken to insure proper backfill under the pipe in the haunch zone.

Backfill material shall meet the following specifications.

Type I - Backfill shall consist of flowable fill in accordance with the City of San Antonio Utility Excavation Criteria Manual section 4.8.5 "Controlled Low Strength Material (Flowable Fill)". The flowable backfill shall be placed across the entire width of the trench and shall maintain a minimum depth of 12 inches above the pipe. A minimum of 24 hours shall elapse prior to backfilling the remaining portion of the trench with other backfill material in accordance with Item 400, "Excavation Trenching and Backfilling".

Type II - Backfill shall consist of cement stabilized backfill in accordance with Article 400.C. Cement stabilized backfill shall be placed and compacted to ensure that all voids are filled completely. Type II backfill shall be compacted in accordance with Item 400 "Excavation, Trenching and Backfilling.

Type III. Backfill shall consist of hard, durable, clean granular material that is free of organic matter, clay lumps, and other deleterious matter. Such backfill shall meet the gradation requirements shown in Table II. The backfill material shall be placed along both sides of the completed structure(s) to a depth of 12 inches above the pipe. The backfill shall be placed in uniform layers not exceeding 6 inches in depth (loose measurement), wetted if required, and thoroughly compacted between adjacent structures and between the structure and the sides of the

trench. Until a minimum cover of 12 inches is obtained, only hand operated tamping equipment will be allowed within vertical planes 2 feet beyond the horizontal projection of the outside surfaces of the structure. Type III backfill shall be compacted in accordance with Item 400 "Excavation, Trenching and Backfilling".

Table II
Gradation Requirements for Type III
Backfill Material

Sieve Number	Percent Retained (Cumulative)
1 inch	0-5
7/8 inch	0-35
1/2 inch	0-75
3/8 inch	0-95
No. 4	35-100
No. 10	50-100
No. 200	90-100

If Type III backfill is utilized, filter fabric shall be placed between the native soil and the backfill. Filter fabric shall conform to the requirements of Texas Department of Transportation Materials Specification 6200, Type 1.

PROTECTION OF THE PIPE

Unless otherwise shown on the plans or permitted in writing by the Engineer, no heavy earth moving equipment will be permitted over the structure until a minimum of 2 feet of compacted fill (permanent or temporary) has been placed over the top of the structure.

Prior to adding each new layer of loose backfill material, until a minimum of 12 inches of cover is obtained, an inspection will be made of the inside periphery of the structure for local or unequal deformation caused by improper construction methods. Evidence of such will be reason for such corrective measures as may be directed by the Engineer.

Pipe damaged by the Contractor shall be removed and replaced by the Contractor at no additional cost to the City.

MEASUREMENT:

This Item will be measured by the linear foot. Such measurements will be made between the ends of the barrel along its flow line. Where spurs, branches or connections to existing pipe lines are involved, measurement of the spur or new connecting pipe will be made from the intersection of its flow line with the outside surface of the pipe into which it connects. Where inlets, headwalls, catch basins, manholes, junction chambers, or other structures are included in lines of pipe, that length of pipe tying into the structure wall will be included for measurement but no other portion of the structure length or width will be so included.

For multiple pipes, the measured length will be the sum of the lengths of the barrels, measured as prescribed above.

PAYMENT:

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "HDPE Pipe" of the size and backfill type specified. This price shall be full compensation for furnishing, hauling, placing and joining of pipes; for all connections to new or existing structures; for moving and reusing headwalls where required; for removing and disposing of portions of existing structures as required; for cutting of pipe ends on skew; and for all labor, tools, equipment and incidentals necessary to complete the work.

No direct payment shall be made for Excavation, bedding, and backfilling for pipe.

BID ITEM:

Item 402: Corrugated Polyethylene Pipe per linear foot (per depth of cut).